DOCUMENT RESUME

ED 266 953 SE 046 465

AUTHOR Robinson, Irene S.
TITLE The Implementation of a Science Lab for Elementary Schools K-3.
PUB DATE Aug 85
NOTE 63p.; Ed.D. Practicum, Nova University.
PUB TYPE Dissertations/Theses - Practicum Papers (043) -- Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Elementary School Science; Experiential Learning; *Inservice Teacher Education; Models; Primary Education; *Program Implementation; Science Education; *Science Instruction; *Science Laboratories; *Science Programs; Science Teachers; Scientific Literacy; Skill Development
IDENTIFIERS *Hands on Experience; Science Education Research

ABSTRACT

A program for remediating science illiteracy among primary level students is offered in this publication. A practicum was designed to address the lack of science teaching and student science experiences at the Marian Boyd School in Warrentown, North Carolina. Priorities included in-service education for teachers, a science laboratory for students, and effective utilization of available resources. Problem areas and probable causes were identified and solution strategies were offered. It was anticipated that implementation of the program would result in improvement of teacher attitudes and competencies in science and science instruction, development of hands-on science learning centers, and student mastery of science process skills. Data and findings reveal that the major program goals were met and that program continuance would be assured. (ML)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

Reduction-1

PRACTICUM REPORT

ED266953

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Center for the
Advancement of Education
Ed.D. Program

THE IMPLEMENTATION OF A SCIENCE LAB FOR ELEMENTARY SCHOOLS K-3

SE 046 465

3301 College Avenue
Fort Lauderdale, Florida 33314
305/475-7300

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Irene S. Robinson

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

NOVA UNIVERSITY

PRACTICUM INFORMATION SHEET*
Ed.D. Program in Early Childhood
Nova University

OCT 1 1 1985

NAME Irene S. Robinson CLUSTER 15

ADDRESS 424 Halifax Street, Warrenton, NC 27589

TELEPHONE (919) 257-3401 (919)257-3695 DATE August 11, 1985
Home Work

PRACTICUM TITLE The Implementation of a Science Lab for Elementary Schools K-3

DOCUMENT IDENTIFICATION

_____ Introductory Practicum Proposal (Observer's name and address on title page)

__X__ Introductory Practicum Report **

_____ Other Introductory Practicum Material

_____ Major Practicum Proposal (Observer's name and address on title page)

_____ Major Practicum Report **

_____ Other Major Practicum Material

Reviewer PR.I Georgianna Lowen, Ed.D. Reviewer PR. II _____

MAIL ALL PRACTICUM MATERIALS TO: Practicum Coordinator
Ed.D. Program in Early Childhood
Nova University
3301 College Avenue
Ft. Lauderdale, FL 33314

*Attach a Practicum Information Sheet to all practicum material.

** VERIFICATION: If this is a practicum report, please have the designated professional verify that the practicum took place as described by signing below.

OBSERVER: Name Barbara B. Talley

Title First Grade Teacher

Address Mariam Boyd School
203 Cousin Lucy's Lane
Warrenton, NC 27589

Signature: Barbara B. Talley

THE IMPLEMENTATION OF A SCIENCE LAB FOR ELEMENTARY SCHOOLS K-3

by

Irene S. Robinson

Cluster 15

A Practicum Report Presented to the Ed.D. Program
in Early Childhood
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

NOVA UNIVERSITY

August 1985

ACKNOWLEDGMENTS

The writer wishes to acknowledge the many individuals who have encouraged and guided her to the completion of this practicum. She will not attempt to name all of them. Though unnamed, they are not forgotten.

Above all, the deepest gratitude is owed to the Creator; without His divine guidance, the practicum would have been impossible.

Knowing that behind every practicum at Nova University, there is a reviewer who has kept it moving and organizing the "disorganized," for this kind of assistance and inspiration, the writer thanks her reviewer, Dr. Georgianna Lowen.

Special acknowledgment is made of the fine typing services of Charles S. Grady, whose diligent work was so important in the completion of this report.

In particular, the writer owes her sincere thanks to the students and teachers of Mariam Boyd School who have shown her how cooperative they can be when a task is at hand.

To a family who has sacrificed much to permit the completion of this practicum implementation--my thanks.

I.S.R.

August, 1985

TABLE OF CONTENTS

	Page
TITLE PAGE	i
ACKNOWLEDGMENTS	ii
TABLE OF CONTENTS	iii
LIST OF TABLES AND FIGURES	v
ABSTRACT	vi
Chapter	
I. INTRODUCTION	1
A. Description of Community Including Economic and Geographic Factors	1
B. Writer's Role and Responsibilities	3
II. STUDY OF THE PROBLEM	7
A. Description of the Problem Situation	7
B. Documentation of the Problem Situation	8
C. Analysis of the Problem	10
D. Relationship of the Problem to the Literature	12
III. ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS	16
A. Goals and Expectations	16
B. Terminal Performance Objectives	16
C. Mechanism for Recording Unexpected Events	17
D. Measurement of Objectives	17
E. Description of Plans for Analyzing Results	18
IV. SOLUTION STRATEGY	20
A. Discussion and Evaluation of Possible Solutions	20
B. Description and Justification for Solution Selection.	21
C. Calendar Plan	22
D. Report of Action Taken	23
Setting Up Science Lab	25
In-service Education for Teachers	28
Other Activities	32

TABLE OF CONTENTS (Continued)

V. RESULTS, CONCLUSIONS, AND RECOMMENDATIONS 33

A. Results 33
Teacher's Self-Evaluation Checklist Results . . . 33
Participant Evaluation of the Staff Development Activity Results 35
Results of Hands-On Learning Centers 35
Results of the Science Process Skills Inventory . . 36
Outside Evaluator 36

B. Conclusions 38
C. Recommendations 38
D. Dissemination 39

REFERENCES 40

Appendices

A SCIENCE NEEDS ASSESSMENT SURVEY 43

B TEACHER'S SELF-EVALUATION CHECKLIST 46

C. PARTICIPANT'S EVALUATION OF STAFF DEVELOPMENT ACTIVITY 48

D SCIENCE PROCESS SKILLS INVENTORY 50

E LETTER OF PRACTICUM RECOGNITION 52

LIST OF TABLES AND FIGURES

Table		Page
1	Percentage of Children Achieving Mastery of Science Process Skills	37

Figure

1	Teacher's Pre- and Post- Self-Evaluation Results . .	34

ABSTRACT

The Implementation of a Science Lab for Elementary Schools K-3. Robinson, Irene S., 1985: Practicum Report, Nova University Ed.D. Program in Early Childhood.
Descriptors: Discovery Learning / Elementary Education / Elementary School Science / Instruction: Learning Processes / Primary Education / Science Activities / Science Education / Science Interests / Student Interests /

This practicum addressed the need to provide a program to remediate scientific illiteracy among the students at Mariam Boyd School. In a review of related literature, it was found that few schools provided effective opportunities for children to experience hands-on experiences in science instruction.

The goal of this program was to create, plan, implement, and evaluate a science program for remediating scientific illiteracy among the students. The most important components of this practicum included in-service education for teachers, a science lab for student utilization, and effective utilization of available resources.

Of the teachers who participated in the implementation, 100 percent attended all class sessions, 100 percent developed science competencies, and at least 86 percent of the children developed skills in the processes of science which are vital for survival.

CHAPTER I

INTRODUCTION

A. Description of Community Including Economic and Geographic Factors

Warrenton is a rural small town and is the county seat of Warren County, North Carolina. It is located in the north central part of North Carolina and is approximately 10 miles from the Virginia line. Warrenton is approximately 108 miles south of Richmond, Virginia and approximately 60 miles northeast of Durham and Raleigh, North Carolina.

Warren County is bound on the west by Vance County, on the south by Franklin County and Nash County, on the east by Halifax County and on the north by Mecklenburg County, Virginia and Brunswick County, Virginia.

Periodically, tourists visit Warren County for several reasons. The County shares a spacious water resort, Lake Gaston, which makes boating, fishing and camping popular. Many hunters come to Warrenton to hunt deer, birds, and other game. Historical sites and historical colonial homes draw many visitors as well.

Warren County is a rural agricultural area with few industries. The majority of the families secure their income from industrial employment in surrounding counties. Agriculture has followed the trend toward mechanization, resulting in fewer jobs in the area.

Warren County has a population of 16,232, according to the 1980 census figures, a growth of 422 since 1970. The town of Warrenton showed a decrease in residents from 1,035 to 908.

The racial makeup of Warren County consists of 59 percent black, 36 percent white, and 4 percent Indian. The town of Warrenton is 19 percent black, 81 percent white and less than 1 percent Indian.

The per capita income in 1980 was $6,608. The unemployment rate was 9.5 percent for December, 1984. The educational norm for adults who are 25 years of age and over is considered low as compared to other counties in North Carolina. About 37 percent of the citizens have completed high school. At least 15 percent of the residents have had some college education. About 1 percent of the residents are college graduates.

Warren County's school system consists of one high school, two middle schools, and five elementary schools.

Mariam Boyd School, one of Warren County's schools, is a K-3 school located on Cousin Lucy's Lane in Warrenton, one block west of U.S. Highway 401. The school was named for Mariam Boyd, an educator who taught in the county for 42 years.

Construction of the school began in 1951 on 6.16 acres of land. Five classrooms and a kitchen were built at a cost of $96,104. When the school first opened in 1956, it served what was known as the Warrenton School District, having an organization of grades 1-3, with an enrollment of 144 white students. In 1966, the enrollment increased to 174 and mobile units were purchased for additional classroom space.

In 1968, two additional acres of land were purchased at a cost of $1,282 per acre. An additional building was constructed at a cost of $455,737.

As a result of a court decision in 1964, black students were admitted in the fall of that year. As a follow-up of the court decision,

two teachers were added to the faculty in the fall of 1968.

In September, 1969, Mariam Boyd School reorganized with a totally desegregated student body and faculty, serving children in grades 1-6. In 1973, additional state funds made it possible to establish a kindergarten center to accommodate approximately 55 students. Due to limited housing facilities, the two kindergarten classes were located 5 miles from Mariam Boyd School at the former Macon Elementary School in Macon. There were 600 enrolled in grades K-6 on two campuses. In 1975, the kindergarten was moved to its present site. In 1981, Mariam Boyd again reorganized to better serve students in grades K-3. All mobile units were eliminated and provisions were made for one multi-purpose room. Approximately 28 percent of the K-3 children in Warren County attend Mariam Boyd School.

At the end of the third grade, the students who are promoted to the fourth grade are transferred to Hawkins Elementary School which is approximately three blocks from Mariam Boyd School.

Mariam Boyd's professional staff consists of a full-time principal, 13 classroom teachers, an EMH/LD teacher, two reading teachers, a media specialist, an itinerant speech/language specialist, an itinerant hearing specialist and an itinerant home-school coordinator. The student enrollment is 361. The student racial makeup consists of 71 percent black, 13 percent white and 16 percent Indian.

B. Writer's Role and Responsibilities

The writer's primary responsibility is to teach a self-contained third grade class at Mariam Boyd School. She is supervised by the

principal. Major duties and responsibilities that are assigned by the Warren County Board of Education include:

1. Teaching assigned subject area using the course of study adopted by the local board of education, and other appropriate learning activities
2. Creating a classroom environment that is conducive to effective learning and appropriate to the maturity and interest of the students
3. Employing a variety of instructional techniques and instructional media, consistent with the needs and capabilities of the individuals or student groups involved
4. Striving to implement by instruction and action the philosophy of the school
5. Evaluating students' academic and behavioral progress, keeping appropriate records and preparing progress reports
6. Diagnosing students' needs on a regular basis and cooperating with other professional staff members at the school and county level in helping students solve health, attitude and learning problems
7. Communicating with parents through conferences and other means to discuss the students' academic and behavioral progress and interpret the school program
8. Developing lesson plans and instructional materials and providing individual and small group instruction in order to adapt the curriculum to the needs of each pupil

BEST COPY AVAILABLE

9. Translating lesson plans into learning experiences so as to best utilize the available time for instruction
10. Assisting the administration in implementing all policies and/or rules governing student life and conduct, developing reasonable rules of classroom behavior and procedure, and maintaining order in the classroom in a fair and just manner
11. Planning and supervising purposeful assignments for the teacher aides and volunteers
12. Making detailed lesson plans for the substitute teacher to follow whenever it is known that sick or personal leave has to be taken
13. Making provisions for being available to students and parents for educational-related purposes outside the instructional day when required or requested to do so under reasonable terms
14. Assisting in the selection of books, equipment, and other instructional materials
15. Maintaining accurate, up-to-date attendance records for all students
16. Supervising pupils in out-of-classroom activities during the assigned working day
17. Administering group standardized tests in accordance with the required testing program
18. Cooperating with other members of the staff in planning instructional goals and methods
19. Attending and participating in faculty meetings

20. Participating on faculty committees and the sponsorship of pupil activities
21. Planning and presenting student assembly programs
22. Providing for professional growth through an ongoing program of reading, attending county and state-sponsored workshops, seminars, conferences and/or taking advanced course work at institutions of higher learning
23. Contributing to positive working relationships among members of the staff of the school system, and presenting a positive professional image to the general public

The writer complies with other duties and responsibilities as assigned by the Board of Education or the administration of the school system.

CHAPTER II

STUDY OF THE PROBLEM

A. Description of the Problem Situation

For the past several years, elementary science has been losing its productivity in the United States of America. Many educators reflect back on the 1960's when national attention was focused on the processes of science education in the elementary schools. Despite the prevalence of research supporting the necessity of science education in early schooling, our nation as a whole seems to take a "back-seat" role in the area of elementary science. Thus, the situation continues to be critical.

Mariam Boyd School, like many of the nation's schools, was no exception. It, too, was failing its mission to meet the scientific needs of the children that it served. Throughout the school setting there was evidence that science was not being given its fair share of the total school curriculum. For example, there were few science displays, projects and interest centers for children to manipulate and investigate. In addition, teachers displayed a need to become more aware of the necessities and benefits of a "hands-on" science curriculum in order to aid children in the development of habits such as touching, hearing, seeing, smelling,and sometimes tasting some of the many wonders of the universe.

Teachers must be encouraged to re-examine the effectiveness of their science activities in order to improve the quality of science education. Careful attention should be focused on sufficient training, allotted time, and hands-on learning that will enable the children to become productive problem solvers.

Ideally, an effective science program prepares the children to become scientifically literate citizens. Being scientifically literate enables the children to cope with a scientific and technological age, to make appropriate decisions, and to have respect for and try to understand the values and judgments of others (North Carolina Course of Study for Elementary and Secondary Schools K-12, 1977). Science should be an integral part of the school program with emphasis on process skills, as well as content materials. An effective program allows opportunities to learn through discovery and inquiry. Ample materials, facilities, surroundings and events are essential for problem-solving skills.

A successful science program depends largely upon the teachers' attitudes and their willingness to change. They must utilize all available resources possible to make learning conducive. Evidence of science excellence should be a community-wide effort if children are to cope with a scientific and technological age.

Briefly stated, this practicum addressed the serious lack of science teaching and science experiences offered to the children at Mariam Boyd School.

B. Documentation of the Problem Situation

The lack of science teaching and science experiences offered to

the children at Mariam Boyd School had been observed as well as documented.

During the school year 1984-85, when the school was making a self-study for re-accreditation for the Southern Association of Colleges and Schools, it addressed science education as an area of needed improvement.

In the winter of 1984, a needs assessment was conducted at Mariam Boyd School by the writer (Appendix A). The survey revealed that:

1. Sufficient consideration was not given to the scope of the science program.
2. The purposes and contents of other learning areas were not considered.
3. More science excursions needed to be permitted, resulting in unanticipated "teachable moments."
4. All possible resources needed to be utilized, resulting as a laboratory for learning science.
5. The curriculum showed a deficiency in materials from the many areas of science subject matter.
6. There were limited opportunities for children to use science in the investigation of problems that are of real concern to them.
7. There was a lack of varied kinds of experiences to provide for individual needs and interests.
8. The program did not sufficiently provide for the utilization of the talents and interests of the teachers involved.
9. There was a shortage of apparatus and materials required for teaching the program.

As part of the survey, teachers were asked to list four reasons as to why they felt that children were scientifically illiterate. The four main reasons listed by the teachers were:

1. Inadequate materials and equipment
2. Lack of attention focused on science
3. Lack of in-service training for teachers
4. Excessive time and funds applied to the "three R's"

During the fall of 1979, many of the key science educators from across the State of North Carolina met to discuss the problems associated with elementary science education. The summary of the conference was the concluding activity of an eighteen-month project funded by the National Science Foundation to disseminate knowledge about elementary science instruction and to conduct a comprehensive survey of the elementary science teaching across the State of North Carolina. The four areas of concern were the most pressing concerns (Coble and Rice, 1979). They were the elementary science curriculum facilities and materials, preservice and in-service education, and the elementary students' welfare.

C. Analysis of the Problem

Several probable causes for the problem of the serious lack of science teaching and science experiences offered to the children at Mariam Boyd School were considered.

The first main probable cause was the over-emphasized textbook approach. The textbook determined what was taught and how it was taught. Using the textbook approach weakened the "hands-on" concepts. Teachers used the textbook approach because few materials were on hand, and they felt more confident using the textbook with workbooks and dittos.

The second main probable cause for the problem was poor utilization of available resources and materials. A trip through the storage areas of the school revealed many unused manipulative materials. Environmental surroundings could also have been utilized more effectively. The location of the school made nature walks accessible. There are wooded areas, nearby supermarkets and fire stations. Mariam Boyd School, being a rural school, offers unlimited opportunities for community career resource persons to enhance the teaching of science. Farmers, taxidermists, dentists, game wardens, foresters and many more can aid the school in making science an enjoyable experience.

The third main probable cause of the problem was a low priority placed on the teaching of science. Teachers felt pressured to teach the "three R's" first, and if time permitted during the day, science was included. The three R's are very important, but they should not become an obsession that results in the "tail wagging the dog" (Hounshell and Coble, 1979).

The fourth main probable cause of the problem was the lack of in-service training for teachers. Many teachers had received limited science training, and few teachers attended science conferences. Teachers needed to feel confident that they could learn to teach science effectively without becoming science experts.

These probable causes of the problem of the serious lack of science teaching and science experiences offered to the children at Mariam Boyd School led to the conclusion that science, a most essential curricular area that is vital for survival, had become neglected and almost forgotten.

D. Relationship of the Problem to the Literature

In 1957 when Russia launched its first satellite, Sputnik, into orbit, the United States became concerned about its rank in scientific power. As a result, government agencies and private foundations sponsored programs in the schools for the purpose of improving the teaching and learning of science.

During the 1960's, several elementary curriculum projects were initiated and implemented in the elementary schools. The formulations of these projects were based on the works of Jean Piaget, Robert Gagné and Jerome Bruner as to how children develop intellectually and learn.

The Commission on Science Education sponsored by the American Association for the Advancement of Science (AAAS) designed a curriculum to improve science in the elementary school known as, Science -- A Process Approach (SAPA). According to Victor (1960), it included a set of scientific behavioral hierarchies based on the findings of Gagné.

The Science Curriculum Improvement Study (SCIS) was established in 1962 at the University of California at Berkely. Its goal was to develop scientific literacy in children. The theories of Piaget and Bruner have been well integrated in this program. The invention lessons introduce new concepts and "discovery" lessons developing application of the concepts (Victor, 1980).

The Elementary Science Study (ESS) was developed in 1960 in Newton, Massachusetts by the Education Development Center. Its goal was to provide opportunities for children to explore interesting problems that extend their knowledge, their insight, and their enjoyment of the physical and natural world.

The ERIC Clearinghouse for Science, Mathematics, and Environmental Education stated in its Summary of NSF Literature Review in Science Education (1979) that the federal government played a major role in funding science materials and equipment for the public schools from 1958-1968. The report further describes how the federal government has placed a lower financial priority on science education in public schools. This lack of support has caused most schools to place less concentration in the area of science education.

Dyrli (1981) explained that toward the end of the last decade, those "non-textbook," lab-centered approach programs are now referred to as the "old" approach. These programs became unpopular chiefly because of the return to the "basics" syndrome, the economy problem, and the lack of professional support. These programs, when used properly are highly productive. If the fundamental importance of student inquiry and the development of information-processing skills are agreed to be basics of education, educators should be willing to invest necessary energy to promote active student learning in the future. Laboratory-centered science instruction is an approach to teaching science that is both crucial and vital.

Achievement in science and attitudes toward science have declined during the past decade in the United States, while several other countries have shown an increase in achievement and attitudes (Troost, 1983; Wirszup, 1984).

Several studies revealed serious problems in the area of science education. A research report by Yager and Penick (1983) revealed that the investigative or laboratory dimension of science is

almost totally ignored. Yager (1984) cited the foremost problem of science education in many elementary schools as being that science has been relegated to a low priority. Neglecting science at the elementary level usually is justified by teaching the "basics." Simpson (1983) stated that schools have not considered science as a "basic" and that our society has not treated science with the same degree of importance during the past decade as many progressive countries have. Conant (1974) found that in one elementary school system the students received an average of not more than two minutes of daily science instruction. Weiss (1978) cited problems in science as resulting mostly from the lack of supplies and equipment, insufficient funds, and insufficient materials. Science texts are poor, diluted, bland, disorganized, and sometimes so inaccurate that many experts advocate using them only in moments of desperation (National Education Association, 1984). Yager and Penick (1983) argued that the supremacy of the textbook is the most serious limit on the teaching of science and that too many teachers believe that the goals of science instruction are limited to certain knowledge and processes.

In an effort to remedy the crisis in science education, a national project was implemented in 1981 by the National Science Teacher Association (1983) called Search for Excellence in Science Education. The selected school program had to meet specific criteria and goals, such as (1) focus on effective consumer behavior; (2) discussion of personal health practices; (3) recognition of people's effect on the environment (and vice-versa); and (4) experiences in resolving scientific problems. One such school system that has an exemplary science curriculum

is Jefferson County, Illinois. Its success is attributed to (1) a careful, long-term assessment of students' needs, (2) the creation of activity-oriented curriculum, and (3) extensive teacher training. Materials used are adapted from the Science Curriculum Improvement Study and the Elementary Science Study. Other materials included the original work of the staff.

Yager, Klein, and McCurdy (1981) found that hands-on activities in which children manipulate objects, derive relationships, experiment, and draw conclusions, make science the most appropriate vehicle for growth in the vital years.

The National Education Association (NEA) noted in 1984 that special emphasis upon programs for students of low and mid-level ability should be included and that democracy cannot afford to leave the mass of its population scientifically untutored. Simpson (1983) warned that if students continue to receive inadequate instruction in science during elementary school, then receive irrelevant and abstract science courses during middle and junior high school, they are likely to drop out of the pool of talent that is vital to filling critical jobs in science in the future. The NEA's report, Quality Education: The State of the Arts (1983-84), urged that consensus today be that every student must study science every day, every year, beginning in kindergarten. It warns that later is too late; less is too little.

CHAPTER III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

A. Goals and Expectations

The goal of this program was to create, plan, implement, and evaluate a science program for remediating scientific illiteracy among the students at Mariam Boyd School. It was anticipated that teachers would develop science competencies and that students would develop in the processes of science that are both crucial and vital.

B. Terminal Performance Objectives

At the end of the practicum implementation, at least 80 percent of the teachers were expected to:

1. Improve in science competencies by 80 percent accuracy as measured by an evaluation checklist.
2. Develop positive attitudes toward the teaching of science by at least 80 percent accuracy as measured by the participant evaluation of the staff development activity.
3. Construct a science hands-on learning center for classroom utilization as measured by observation.

At the end of the practicum implementation, at least 80 percent of the students were expected to perform the following process skills with at least 80 percent accuracy as measured by an evaluation checklist:

1. Observing (K-3)
2. Classifying (K-3)

3. Using numbers (K-3)
4. Inferring (2-3)
5. Interpreting (2-3)
6. Controlling variables (2-3)
7. Measuring (K-3)
8. Predicting (K-3)
9. Using space/time relation (K-3)
10. Defining operationally (2-3)
11. Formulating hypotheses (2-3)
12. Experimenting (2-3)
13. Formulating models (2-3)
14. Communicating (K-3)

C. Mechanism for Recording Unexpected Events

Although it was expected that positive results would be achieved in finding solutions to the problems presented in Chapter II, provisions were made to deal with the possibility that the ideal would not exist in all situations. Accordingly, in the event that an objective was not successfully evaluated, additional information would be documented in a log maintained by the writer. Further, teachers were asked to keep a record to document any unexpected outcomes that appeared during the practicum.

D. Measurement of Objectives

The teacher's self-evaluation checklist form described in objective 1 (Appendix B) is based upon a rating scale of 1-3. It permits

the teacher to evaluate the classroom atmosphere and teaching performance. The checklist was to be used as a pre-evaluation and a post-evaluation instrument.

The instrument to be used to measure objective 2 (Appendix C) was a participant evaluation checklist which consisted of a 5-point Likert-type scale. Participants were to be asked to rate the degree to which they agreed with 13 activity statements as follows:

1 - Strongly agree

2 - Agree

3 - Undecided

4 - Disagree

5 - Strongly disagree

The terminal performance objectives for children consisted of an inventory of fourteen performance indicators. Each teacher was to complete a consolidated class evaluation form. This instrument was to be used as a pre-evaluation and a post-evaluation instrument. The teachers were to be asked to write the number of children that could successfully master each of the fourteen process skills (Appendix D).

The science centers that teachers would create in their classrooms were to be evaluated through observational techniques. Photographs were to be taken of each classroom before the practicum implementation and after the practicum implementation, to compare results.

E. Description of Plans for Analyzing Results

The evaluation forms were to be completed at the end of the implementation. Pre-evaluation and post-evaluations were to be compared.

Results were to be recorded and analyzed. A bar graph was to be constructed to show improvement in specific areas.

CHAPTER IV

SOLUTION STRATEGY

A. Discussion and Evaluation of Possible Solutions

A review of the literature revealed that elementary science has not received its fair share of the total school curriculum. Moreover, very few educational systems have come up with possible solutions to solve this problem.

Others facing similar situations might consider hiring a science coordinator; however, this was impossible because the school did not have the funds to pay a coordinator.

A second possible solution was to provide college courses to properly train teachers to teach science. This was an inappropriate solution, because the school lacked the funds to offer these courses and there are no nearby colleges or universities.

A third possible solution was to purchase science hands-on curriculum kits. Considerable time, effort, and money have been devoted toward the development and improvement of these kits, which have been available for several years and have been consistently revised to better meet the needs of children. Most importantly, science curriculum kits have been evaluated as highly successful (Mechling and Oliver, 1983) due, in part, to their effective hands-on principles and easy teach-ability. This solution was impossible because the school system could not afford to purchase these kits.

B. Description and Justification for Solution Selection

The solution that was selected for implementation consisted of three main components: (1) Establishment of a science laboratory; (2) in-service science education for teachers; and, (3) Use of community resources.

The most important component of the solution phase was to convert an unused room into a room in which children can discover, explore, and enjoy. Teachers were trained to use materials employed in the lab. A schedule was provided for lab utilization. Classes were expected to come to the lab at least once a week. The lab was expected to provide opportunities for unlimited experiences that would help the children to become scientifically literate.

Through in-service science education, teachers received staff development credits for successful participation in staff development. These sessions were designed to increase teachers' competencies and to motivate teachers to try different teaching strategies in order to be able to teach science more effectively. Teachers were given opportunities to ask questions and also to share their expertise with others during the sessions. Each of the five sessions was 90 minutes long. Consultants from the North Carolina Department of Public Instruction and from Vance-Granville Community College were utilized. Also, the writer conducted some of the sessions.

Research reveals that effective schools involve community interaction. A solution to the problem was to involve community participation. Parents and volunteers were invited to come and share their expertise. Businesses were encouraged to contribute to the science program. Students

were also encouraged to bring specimens and other materials.

It was felt that this proposed solution to the problem would work because the plans were inviting, non-threatening, unique, and motivating for both teachers and students. All students and staff members were involved in the implementation. This solution had a "doing" concept which was crucial to its success as well as vital for human survival in an age of technology.

The writer proposed the following steps toward solving the problem:

1. Have conferences with principal on pertinent matters.
2. Collect and/or purchase organisms, materials, and other resources for the science lab and individual classrooms.
3. Set-up and expand the science lab as materials and equipment become available.
4. Offer in-service science education to the professional staff.
5. Utilize a science consultant from the North Carolina Department of Public Instruction, and, colleges/universities.
6. Arrange to secure community and professional persons.
7. Demonstrate lessons on discovery learning and good questioning techniques, and share with the professional staff.
8. Assist teachers with classroom science centers and projects.

C. Calendar Plan

8/84 - Step 6 -- Submit outline, IRS, and Review of Literature

8/84 - Step 7 -- Feedback from reviewer

8/84 - Step 7 -- Revise outline

3/85 - Step 8 -- Prepare proposal

3/85 - Step 9 -- Feedback and permission to implement

3/85 - Step 10 - Implement proposal

3/85 - Set up science room

3/85 - Order and/or secure materials, etc.

4/2/85 - Conduct first workshop; Orientation; Demonstration lessons on discovery learning and good questioning techniques

4/16/85 - Conduct second workshop: Utilizing Community Resources

4/30/85 - Conduct third workshop: Utilizing Professional Science Representatives from the State Department of Public Instruction

5/14/85 - Conduct workshop: Teaching Science to Exceptional Children

6/4/85 - Conduct wrap-up workshop; Brainstorming; Questions and Answers; Make It/Take It

6/11/85 - Evaluation of implementation by staff

6/11/85 - End of implementation period

8/11/85 - Step 11 -- Submit report

8/27/85 - Step 12 -- Feedback from reviewer

9/3/85 - Step 13 -- Distribute abstracts to cluster

D. Report of Action Taken

The action taken to implement the solution strategies was in accordance with the plan previously mentioned in this chapter. The

timetable of the practicum implementation also followed the original calendar of events.

In March 1985, with the practicum implementation, efforts were initiated to begin the eradication of scientific illiteracy among the children at Mariam Boyd School. The selection of the writer as project leader was based on her leadership ability in elementary science instruction, master teacher status, experience, and competence in her field, as well as in related areas of study. The writer was able to demonstrate positive attitudes toward science and to communicate her interest in science to the other teachers, the students, and the public as well.

While the writer was responsible for providing top-quality science experiences for the teachers and children of this school, she felt that other consultants were needed to give the program added value and enthusiasm.

The writer assumed the following science leadership roles as suggested by Mechling and Oliver (1982):

1. Conducting surveys to determine the needs of the science program
2. Discussing science with teachers and the principal
3. Visiting classrooms when science lessons were taught
4. Sharing science success stories as models for teachers to emulate
5. Devoting PTA meetings to science
6. Mounting a publicity campaign for science
7. Identifying community resources which enhanced science instruction

8. Insisting that science be taught for specified amounts of time
9. Checking state and local regulations to determine science requirements
10. Examining the school's goals for science instruction
11. Taking pictures of the science lab and of individual classrooms on a routine basis

The school principal added to the success of the program by (Mechling and Oliver, 1982):

1. Providing a petty-cash fund for the purchase of inexpensive local supplies
2. Anticipating costs related to program selection and teacher attendance at the North Carolina Science Teacher Association, Incorporated, State Convention
3. Making allowances for costs relating to science in-service programs
4. Assisting the writer in designing programs to spark new life into science instruction
5. Assisting the writer in securing a community college consultant and a North Carolina Department of Public Instruction Science Consultant
6. Showing positive support for the total science project

Setting Up Science Lab. The first step in implementing the practicum was to start with the empty room that had been chosen as the science lab. Available furniture included three bookshelves that children could use to manipulate materials, four student tables, and a cabinet with sink

and running water. The room was also equipped with three closets, one of which was a lockable teacher's closet that was used to secure items that were not suitable for uncontrolled student exposure. The room was air-conditioned and located on the southwestern side of the school building, making it conducive to the growth and development of certain plant life.

The second step was to gather materials for the science lab. An inventory revealed the existence of a lot of seldom used materials and equipment. Placed in the science lab for utilization were the following items:

1. Projecting microscopes
2. Regular microscopes
3. Assorted rocks, tiles, buttons, pieces of cloth, and shells
4. Seeds, potting soil, and pots for planting
5. Magnifiers
6. Flasks, funnels, and beakers
7. Microscope slides
8. Petri dishes
9. Wire gauze
10. Dry-cell batteries and wire
11. Standard measuring devices
12. Metric materials

As organization of the science lab progressed, volunteers made contributions to the lab by adding objects such as bird nests, aquariums, plants, small animals, pictures, and science magazines. All of the lab materials were loaned to individual classrooms as needed.

As businesses and industries became aware of the school's plans to become scientifically literate, several made financial contributions to show support for the program.

After taking a look at what was available, certain materials were purchased. Those items included complete inquiry kits on weather, electricity, magnetism, plants, rocks, air, and pulleys. Several small items were ordered such as compasses and prisms.

The science lab was set up in a child-centered environment. Consideration was given to individual interests, individual attention spans, and individual learning rates so as to provide the potential for learning success for each child. Emphases were more on the process of "doing" rather than on correct answers. Self-confidence was highly related to the student's ability to learn and to make important decisions concerning the scientific processes. Realizing that children learn best in an atmosphere which is non-threatening, trust was built between teachers and students. Lines of communication were kept open so that children could express themselves openly.

Students learn best by being allowed to manipulate concrete materials; therefore, a wide variety of materials was made available.

A weekly schedule was established for teachers and their students. Each teacher had an individual time period alloted. Kindergarteners came on Mondays, first graders on Tuesdays, second graders on Wednesdays, and third graders on Fridays. Thursdays were kept open for flexibility. If a teacher was unable to come during her designated time, she could come during a vacant period, or, she could check out materials for use in her classroom.

In-service Education for Teachers. To assure maximum results, a series of staff development activities were conducted. The first staff development activity introduced the teachers to the science lab, and teachers were given some strategies on discovery learning and good questioning techniques. The writer introduced the teachers to the lab and explained how the inquiry kits were to be used.

The discovery learning activities were conducted by the science consultant from the North Carolina Department of Public Instruction. Discovery learning strategies taught teachers to involve the children in the use of processes of science to develop information. The students should be totally involved with materials to develop concepts and facts without reading or listening to verbal information from the teacher. The discovery learning activities conducted by the State Science Consultant, involving the science process skills, consisted of the following fourteen sets of distinct activities:

1. Observing activities involved using one or more of the senses in perceiving properties or similarities and differences in objects and events. Observations were made directly with the senses or indirectly through the use of simple or complex instruments. Observations were influenced by the previous experience of the observer.
2. Classifying activities involved the sorting or ordering of objects according to their properties or similarities and differences. Classification was based on observational relationships which existed between objects or events.
3. Using space/time relations activities meant describing the

spatial relationships of objects and their change with time. Examples of this process skill were motion, direction, and spatial arrangement, symmetry, and shapes.

4. Using numbers activities was a means of quantifying measurements or comparisons. Numbers were needed to manipulate measurements, to order, and classify objects.
5. Communicating activities involved the transmission of observable data. Examples of communication media were spoken or written words, graphs, drawings, diagrams, maps, and mathematical equations. Such skills as asking questions, discussing, explaining, reporting, and outlining aided the development of communication skills.
6. Measuring activities were the ordering of things by magnitude such as area, length, volume, and mass. Measuring helped quantify observations. The process involved the use of instruments and the skills needed to effectively use them.
7. Inferring activities involved the use of logic to make conclusions from observations. Inferring suggested explanations, reasons, or cause for events. Inferences were based on judgments and were not always valid.
8. Predicting activities involved suggesting what would occur in the future. Predictions were based on observations, measurements, and inferences about relationships between or among observed variables. Prediction was speculation of what would happen based on past experiences. Accuracy of prediction was closely affected by the accuracy of the observation.

9. Interpreting data activities were complex skills involving many of the other process skills. They involved making predictions, inferences, and hypotheses from a set of data. Interpretations may have needed revision when additional data were obtained.

10. Controlling variables activities involved the management of the conditions or factors in an experiment. Unless the variables of an experiment could be carefully regulated, the results of the experiment were not reliable.

11. Defining operationally activities involved stating definitions in working terms. Such definitions limit the meaning of a term to "what is done" and "what is observed." Example of a working definition: A dry cell, when properly connected with two wires and a light bulb, will cause the bulb to glow.

12. Formulating hypotheses activities involved forming a generalization question based on observations. The hypothesis was a problem to be solved through using other process skills, especially experimenting. Questions, inferences, and predictions could lead to the formation of a hypothesis. The hypothesis had to be tested if its credibility was to be established.

13. Experimenting activities involved testing a hypothesis under controlled conditions in which variables were limited. Experimenting was basic to the total scientific process and used all of the other process skills.

14. Formulating models activities were useful ways of describing and explaining interrelationships of ideas. A model may have been a mental, physical, or verbal representation of an idea. Models represented what one knew about an idea or concept and were constantly changing as new data were obtained.

Because questioning is so critical, special attention was given to this concept. Questioning consisted of training the teachers to develop questioning techniques that were motivating, interesting, and stimulating in order to spark children to make their own discoveries. To help the children develop higher levels of thinking, questions were focused on the knowledge level, then on the translation level, and finally on the interpretation level. It was suggested that teachers think seriously about their questions before asking them, and after the question is asked, the teacher should wait before responding, reacting, or asking another question. Wait time gives children time to focus their attention on the answer and clarify their responses to the question being asked.

A second in-service workshop dealt with utilizing community resources and was conducted by a science consultant from Vance-Granville Community College. This workshop lent itself toward making effective use of the environment. Skills stressed were: (1) collecting and observing small animals, such as insects and amphibians; (2) collecting and classifying rocks and soil; (3) taking nature walks, (4) utilizing simple materials, e.g., milk cartons, for insect observation; and (5) making a simple cartesian from a plastic bottle and a stopper.

The third workshop involved the same consultant from the State Department of Public Instruction. Process skills were reiterated and

further activities were performed.

A fourth workshop involved teaching science to exceptional children. For the slow learner, emphases were placed on learning how to learn skills; whereas, high order thinking skills were emphasized for the bright and gifted students.

The fifth in-service activity consisted of a "make it/take it" workshop to which teachers brought teacher-made activities to share with the other participants. The teachers also created additional learning activities to add to their own science centers. These hands-on activities focused on space, time, energy, and matter. The teachers were highly involved in securing activities for classroom utilization and were not overly concerned with mere questions and answers.

Other Activities. As the implementation progressed, pictures were taken of the science lab and the classroom science centers as evidence of effective science training.

Community volunteers also aided this project. For example, an incubator was loaned to the science lab which enabled the children to observe birds, chickens, ducks, and turkeys hatch and grow. (Through these activities, the children not only learn process skills, but also they developed a sense of responsibility.) In addition, the parents also became aware of the science lab activities and they too donated materials and equipment for lab utilization.

CHAPTER V

RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

A. Results

As previously stated in Chapter Three, this practicum was designed to create, plan, implement, and evaluate a science program for remediating scientific illiteracy among the students at Mariam Boyd School. It was anticipated that through the establishment of a science lab, in-service science education for teachers, and the use of community resources, the teachers would develop science competencies and the students would develop skills in the processes of science that are both crucial and vital. More precisely, at the end of the practicum implementation, at least 80 percent of the teachers were expected to improve in science competencies, develop positive attitudes toward teaching science, and construct a science hands-on learning center for their classrooms. Concurrently, at least 80 percent of the students were expected to perform fourteen science process skills with at least 80 percent accuracy.

Teacher's Self-Evaluation Checklist Results. The Teacher's Self-Evaluation Checklist (Appendix B) was used to measure improvement in science competencies (Terminal Performance Objective 1). This instrument, which permitted the 18 teachers to evaluate classroom atmosphere and teaching effectiveness, was used for both pre-evaluation and post-evaluation.

Analysis of the results of the pre-evaluation revealed that 7 out of 18 teachers, or 39 percent, demonstrated effective teaching performance in science instruction, while the remaining 11 teachers, or 61 percent, demonstrated ineffective teaching performance in science instruction.

Analysis of the results of the post-evaluation revealed that all 18 teachers, or 100 percent, demonstrated teaching effectiveness in science instruction.

Effective teaching performance was operationally defined as checking the "Often" category as to frequency of performance of listed tasks. Ineffective teaching performance was operationally defined as checking the "Sometimes" or "Rarely or Never" categories as to frequency of performance of listed tasks.

A comparison of the results of the pre-evaluation and the post-evaluation is shown in Figure 1.

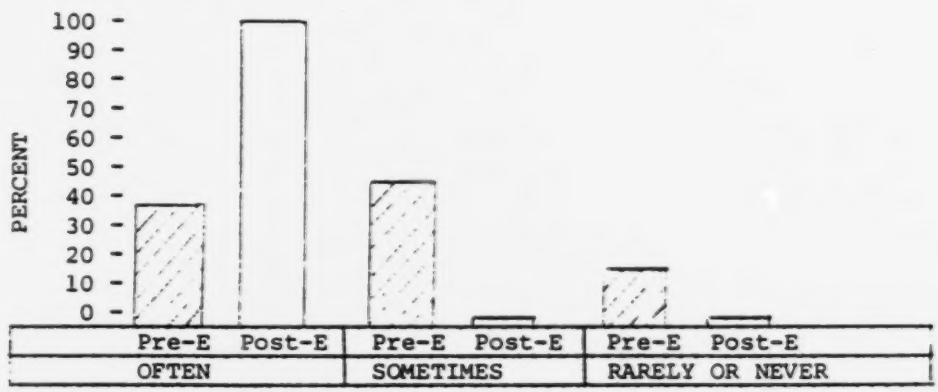

Figure 1. Teacher's Pre- and Post- Self-Evaluation Results.

It was projected in Terminal Performance Objective 1 that 80 percent of the teachers were expected to improve in science competencies. This objective was achieved.

Participant Evaluation of the Staff Development Activity Results. At the end of each staff development activity, the teachers were given a participation evaluation form (Appendix C) which was used to measure the second Terminal Performance Objective. The second objective was related to developing positive attitudes toward the teaching of science. After each session, data were compiled and teacher percentages derived.

The data revealed that after each of the five sessions was completed, all 18 teachers, or 100 percent, had developed positive attitudes toward science instruction as indicated by either Strongly Agreeing or Agreeing with all thirteen staff development activities as listed on the evaluation form. Specific percentages were as follows: (1) First Session - 97 percent strongly agreed; 3 percent agreed; (2) Second Session - 95 percent strongly agreed; 5 percent agreed; (3) Third Session - 91 percent strongly agreed; 9 percent agreed; (4) Fourth Session - 94 percent strongly agreed; 6 percent agreed; and, (5) Fifth Session - 93 percent strongly agreed; 7 percent agreed.

The mean score for the five sessions was 94 percent. It had been projected that 80 percent of the teachers would develop positive attitudes toward the teaching of science. This objective was reached.

Results of Hands-On Learning Centers. The hands-on learning centers were evaluated by observational techniques. Photographs were taken of each classroom before the practicum implementation and after the practicum implementation to compare results.

Before the practicum implementation, the photographs revealed that 22 percent of the teachers displayed an adequate science learning center, while 78 percent of the teachers displayed inadequate science learning centers. After the practicum implementation, 100 percent of the teachers displayed effective science learning centers as measured by observation and photographic techniques.

It was projected in the Third Terminal Performance Objective that at least 80 percent of the teachers would construct a science hands-on learning center for classroom utilization. The objective was achieved.

Results of the Science Process Skills Inventory. There was a total of 361 children evaluated during the course of the practicum. Each teacher was asked to carefully review and evaluate each child with respect to science process skills development. Each teacher completed a consolidated class evaluation form (Appendix D) at the beginning and at the end of the implementation. A comparison of the pre-evaluation and post-evaluation results is shown in Table 1.

An analysis of the data revealed considerable student progress in the area of process skill development. The mean score for the pre-evaluation of the process skills was 63 percent; the mean score of the post-evaluation of the process skills was 86 percent. A gain of 23 percent was thus obtained. At the beginning of the practicum implementation, it was projected that 80 percent of the children were expected to perform the science process skills with at least 80 percent accuracy. The objective was achieved.

Outside Evaluator. An elementary consultant made a brief

Table 1

Percentage of Children Achieving Mastery of Science Process Skills

Process Skill	Pre-Evaluation	Post-Evaluation	Difference*
1. Observing	67	86	19
2. Classifying	60	91	31
3. Using Numbers	63	86	23
4. Inferring	56	82	26
5. Interpreting	61	83	22
6. Controlling Variables	62	81	19
7. Measuring	63	88	25
8. Predicting	59	83	24
9. Using Space/ Time Relations	61	87	26
10. Defining Operationally	57	84	27
11. Formulating Hypotheses	59	82	23
12. Experimenting	66	85	19
13. Formulating Models	69	82	13
14. Communicating	74	92	18
Mean	63	86	23

* Positive (Gain)

evaluation of the science program which can be summarized as follows:

1. The teachers have excellent science experiences provided for the students within their classrooms.
2. The science lab is an excellent innovative concept, and merits additional materials and funding.

B. Conclusions

A summary of the results of this practicum indicates that all objectives have been successfully accomplished. By establishing a hands-on science lab for children and providing adequate staff training for teachers, this project revealed what many science educators have known for years.

Developing a science hands-on lab is an appropriate procedure for facilitating science process skill development and it leads students to extend their knowledge through further investigations.

Because of the success and innovativeness of this project, it is expected to become a permanent part of Mariam Boyd School's science curriculum.

C. Recommendations

Based upon a survey of related literature and experiences in science education, the following recommendations are made:

1. Teachers must be properly trained to teach science effectively.
2. Children must be given unlimited opportunities to explore and discover; mastery of science comes not through formal explanation and rules, but as a result of each student's

individual activities, efforts, and understanding, and the deliberate use of science in lifelike situations.

3. Science lab experiences should be appropriate to the student's developmental level.
4. High order skills should be included as a part of the program.
5. A hands-on science lab should have a continuous plan in order to gain maximum success.

D. Dissemination

The solution strategy of the practicum was shared with all of the faculty members at Mariam Boyd School. Other schools in Warren County have inquired about the innovation, and they plan to replicate the program.

The writer, wishing to procure more materials and equipment for the project, wrote a proposal, on her own initiative, to the North Carolina Science Teachers Association (NCSTA), Incorporated, which is affiliated with the National Science Teachers Association, Incorporated. A committee was appointed by the President of NCSTA to evaluate the proposal. Ratings based on innovativeness, establishment of needs, realistic plan of action, replicability, and the number of persons to benefit, caused the practicum implementation to merit grant funds (Appendix E).

As a result of the success of the practicum implementation, it will be presented to the NCSTA State Convention in a session at North Carolina State University, Raleigh, North Carolina on November 8, 1985.

Abstracts of this practicum will be shared with Ed.D. students (Cluster 15) at Nova University, Fort Lauderdale, Florida.

REFERENCES

REFERENCES

Coble, C. R. & Rice, D. R. (1979). What we need to improve elementary science in North Carolina. Unpublished paper. Greenville, NC: East Carolina University.

Conant, E. H. (1974, January). What do teachers do all day? Saturday Review World, p. 55.

Dyrli, O. E. (1984). Should we scrap lab-centered science programs? Learning, 9(9), 34-39.

ERDC Clearinghouse for Science, Mathematics and Environmental Education. (1979). Summary of National Science Foundation, Literature Review in Science Education.

Harms, N. C. & Yager, R. E. (1981). What research says to the science teacher. Washington, DC: National Science Teachers' Association.

Hounshell, P. B. & Coble, C. R. (1978). Science is basic. North Carolina Education, 9(5), 16-17.

Hurd, P. D. (1984). Science Education: The search for a new vision. Educational Leadership, 41(4), 20-23.

Mechling, K. R. & Oliver, D. L. (1983). Handbook IV: What research says about elementary school science. Clarion, PA: Clarion University of Pennsylvania.

National Education Association. (1984). Today's Education Annual Edition: Quality education: The state of the arts, pp. 21-58.

North Carolina Department of Public Instruction. (1981). Curriculum Study: Science: A report from the science curriculum study committee to the North Carolina State Board of Education. Raleigh, NC: Author.

North Carolina Department of Public Instruction. (1977). Course of study for elementary and secondary schools K-12. Raleigh, NC: Author.

Simson, R. (1983, June). National attentiveness to science: An educational imperative for the eighties and beyond. Education, pp. 7-11.

Troost, K. M. (1984). What accounts for Japan's success in science education? Education Leadership, 41(4), 26-29.

Victor, E. (1980). Science for the elementary school. New York: Macmillian Publishing Co.

Walsh, E. & Walsh, J. (1980, October). Crisis in science classrooms. Science 80, pp. 17-22.

Weiss, I. R. (1977). The report of the national survey of science, mathematic, and social studies education. Research Triangle Park, NC: Center for Educational Research and Evaluation.

Wirszup, I. (1981, January). Professor says Soviet education better than US in science and mathematics. Update, ASCO.

Wirszup, I. (1984). Education and national survival confronting the mathematics and science crisis in American schools. Educational Leadership, 40(4), 4-11.

Yager, R. E. (1984). Toward new meaning for school science. Educational Leadership, 41(4), 12-19.

Yager, R. E., Kline, S. E., & McCurdy, D. W. (1981). Science activities are central to science education in the elementary school. Science and Children, 19(1), 42-43.

Yager, R. E. & Penick, J. E. (1983, August). School science in crisis. Curriculum Review, pp 67-70.

APPENDIX A

SCIENCE NEEDS ASSESSMENT SURVEY

SCIENCE NEEDS ASSESSMENT SURVEY

Please answer the following statements by circling the response which best matches your opinion.

5 = strongly agree
4 = agree
3 = adequate
2 = disagree
1 = strongly disagree

		Circle One
1.	There is consideration given to the complete scope of the science program.	5 4 3 2 1
2.	The purpose and content of other subject-matter areas are considered.	5 4 3 2 1
3.	The program is flexible enough to permit "science excursions" into the unplanned, the unexpected, the unusual, the unknown, and resulting in the unanticipated "teachable moments".	5 4 3 2 1
4.	There are built-in procedures of evaluation to permit needed changes.	5 4 3 2 1
5.	The environmental surroundings of children are (supermarkets and factories, roadways and automobiles, earthworms and robins, lawns and sidewalks) used as a laboratory for learning science.	5 4 3 2 1
6.	The curriculum includes materials from the many areas of science subject matter.	5 4 3 2 1
7.	There are opportunities for children to work on their own, with adequate materials, and to proceed at their pace without pressure.	5 4 3 2 1
8.	There are opportunities for children to use science in the investigation of problems that are of real concern to them.	5 4 3 2 1
9.	The organization and selection of content and processes take into account what we know about how children learn.	5 4 3 2 1
10.	There are varied kinds of experiences to provide for individual needs and interests, and capacities of children.	5 4 3 2 1

		Circle One
11.	Provisions are made for the poor reader or non-reader, as well as for the good reader.	5 4 3 2 1
12.	The program provides for the utilization of the talents and interests of the teacher involved.	5 4 3 2 1
13.	Effective in-service training in science is provided.	5 4 3 2 1
14.	The science program takes into account the school organization.	5 4 3 2 1
15.	The apparatus/material required for teaching science is reasonable.	5 4 3 2 1

List four reasons why you think that the students at this school are scientifically illiterate.

a.

b.

c.

d.

APPENDIX B

TEACHER'S SELF EVALUATION CHECKLIST

TEACHER'S SELF-EVALUATION CHECKLIST

In my classroom there is an opportunity or provision for pupils to:	Often	Sometimes	Rarely or Never
1. Recognize and raise problems which are of interest and importance	_____	_____	_____
2. Acquire skill in limiting and defining problems	_____	_____	_____
3. Develop an understanding of the basic concepts involved in the problem defined	_____	_____	_____
4. Evaluate and challenge sources of information	_____	_____	_____
5. Distinguish between fact and fantasy..	_____	_____	_____
6. Propose hypotheses	_____	_____	_____
7. Develop experiments to test hypotheses	_____	_____	_____
8. Use some of the common scientific instruments	_____	_____	_____
9. Observe accurately	_____	_____	_____
10. Report and record data	_____	_____	_____
11. Explain natural phenomena as they relate to the problem	_____	_____	_____
12. Withhold judgment until evidence from all available sources is collected ...	_____	_____	_____
13. Apply concepts developed to other problems	_____	_____	_____
14. Apply learned concepts to daily life..	_____	_____	_____
15. Engage in individual science interests and projects	_____	_____	_____
16. Increase proficiency in basic skills (arithmetic, writing, reading) through science activity	_____	_____	_____

APPENDIX C

PARTICIPANT'S EVALUATION OF STAFF DEVELOPMENT ACTIVITY

SD-26A
REVISED EDITION

PARTICIPANT EVALUATION OF THE STAFF DEVELOPMENT ACTIVITY

49

Instructions

Each participant in this staff development activity should evaluate the quality of the activity by checking whether he/she Strongly Agrees, Agrees, is Undecided, Disagrees, or Strongly Disagrees with each of the statements below. (The director of the activity should summarize for the group and record the results in Section I of the Evaluation Report Form SD-26.)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	
					1. The activity objectives were related to my educational concerns.
					2. The activity objectives were related to practical educational application in my specific job setting.
					3. The activity had some outstanding components which were unique or innovative.
					4. Presentations were well organized.
					5. The program schedule was well adapted to my educational needs.
					6. My questions were satisfactorily answered by personnel conducting activity.
					7. Meeting facilities were suitable.
					8. The strategies utilized, including instructional resources, were appropriate for meeting the stated objectives.
					9. Overall, personnel conducting the activity exhibited the qualities essential to the success of the workshop. (Consider creativity, specialized knowledge, communication skills, and the like.)
					10. Overall, the activity was a successful training experience for me.
					11. Adequate provisions were made for me to provide feedback to the personnel conducting the workshop.
					12. Adequate provisions were made for me to identify needs which were not previously identified.
					13. As a result of this staff development activity, I will alter my educational behavior in a more positive direction in my specific job setting.

Comments: _____

_____

_____

_____

_____

JEH/shw
4/78

APPENDIX D

SCIENCE PROCESS SKILLS INVENTORY

SCIENCE PROCESS SKILLS INVENTORY

List the number of students in your classroom that can effectively:

_____ Identify properties of an object, i.e., shape, color, size, texture (K-3)

_____ Group objects according to a given property such as shape, color, size, texture, or others (K-3)

_____ Count objects when given groups of objects (K-3)

_____ Use words, simple drawings, diagrams, or charts to transmit information learned from a science experience (K-3)

_____ Measure an object's dimension such as length when given an object and an appropriate measuring instrument (K-3)

_____ Predict beyond the range of observed data when given a histogram (bar graph) showing a linear trend (2-3)

_____ Describe an object's position (above, below, beside, etc.) in relation to other objects when given a situation involving positions of objects (K-3)

_____ Infer one or more properties of an object based on observations through senses other than sight when given a concealed object (2-3)

_____ Interpret the information when given a simple histogram or bar graph (2-3)

_____ Identify variables such as water or light in an experiment on growing plants (3)

_____ State their working definitions based upon past experiences when given a list of terms such as heat, cold, car, or light (2-3)

_____ Develop a hypothesis to account for the observations when given a series of observations or a simple problem (3)

_____ Design and conduct an experiment involving one variable when given appropriate materials and a simple problem (Variable - a factor which is subject to change such as the amount of water to be used in a plant experiment.) (2-3)

_____ Explain a phenomenon by developing models when given an unexplained observation such as dropping two similar balls which bounce at different heights (3)

APPENDIX E

LETTER OF PRACTICUM RECOGNITION

NORTH CAROLINA SCIENCE TEACHERS ASSOCIATION, INC. 53

BOX 25342 • RALEIGH, NORTH CAROLINA 27611

August 26, 1985

Ms. Irene S. Robinson
Mariam Boyd School
203 Cousin Lucy's Lane
Warrenton, NC 27589

Dear Ms. Robinson:

Congratulations!

On behalf of the North Carolina Science Teachers Association's Innovative Curriculum Support Grant Committee. I would like to thank you for submitting an application for the 1985-86 funds. I am happy to inform you that your proposal was selected to receive a $[redacted] award for funding during the 1985-86 school year. A check for $[redacted] will be mailed to you within the next three weeks by the NCSTA treasurer.

You are required to spend the funds as proposed and submit a summary of the expenditures at the end of the school year. Please see the enclosed form for details. Any funds that are unexpended at years end must be returned.

The president of the association would like to recognize you at the State Convention in Raleigh at McKimmon Center on Friday, November 8, 1985, at the general session. Please make plans to be present if at all possible. Check your September issue of "The Reflector" for more details.

A brief summary statement (two typed pages) will need to be written at the end of the project.

If there are questions, please contact me at my office (919) 732-8126, or my home (919) 732-9511.

Thank you for your attention in this matter, and once again, CONGRATULATIONS!

Sincerely,

Ira R. Trollinger

Ira R. Trollinger, Ph.D.

crm

cc: Sarah S. Ormond, NCSTA President

Dr. Ira R. Trollinger
Assistant Superintendent
for Instructional Services
Orange County Schools
200 East King Street
Hillsborough, NC 27278